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Changing National Forest Values: A Content Analysis

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"If we could first know where we are and whither we are tending, we could better judge what we do and how to do it..."

— Abraham Lincoln

The evolution of forest values is currently being widely discussed and debated in the forestry community. It is often claimed that a fundamental shift in forest values has taken place in recent decades. For example, historian Samuel Hays claimed that "New values have emerged about what the forest in America is and what role it ought to play in modern society" (1988:550). Shands (1991) stated that managing the national forests in ways that are responsive to changing public values is the core problem faced by the USDA Forest Service. Gordon (n.d.) argued that a shift in public values is part of the explanation for the declining influence of the multiple-use sustained-yield paradigm of forest management. It is increasingly recognized that the values people hold about forest ecosystems are an important part of the social underpinning of ecosystem management, the emerging forest management paradigm. Grumbine (1994:34) went further, arguing that "Ecosystem management is an early stage in a fundamental reframing of how humans value nature." Thus, ecosystem management can be viewed as a response to changing values or as a driving force that is creating value change. In either case, values play a critical role in identifying ecosystem management goals, setting the context for decisionmaking, and guiding our choices.

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Forest values are defined here as relatively enduring conceptions of "the good" related to forests and forest ecosystems. Value in this sense is sometimes referred to as an ideal or a held value. A more systematic understanding of recent changes in forest values is needed to develop resource management approaches that are responsive to changing forest values and to anticipate the future evolution of forest values. Several recent studies have analyzed forest and related value systems at a particular point in time (e.g., Holler 1990, Steel *et al.* 1994, Vining and Ebreo 1991). But there has been little research on how forest values—or environmental values in general—have changed over time. This is due in part to the limited number of approaches available to analyze the evolution of abstract constructs such as values.

One way to study change in environmental values over time is by means of historical analysis. This approach typically involves developing or adapting a theoretical framework through which historical events and trends are analyzed and interpreted. For example, Twight (1983) used the theory of sociologist Talcot Parsons to analyze the clash of organizational values between the USDA Forest Service and the USDI National Park Service in the 1930's. A historical approach to studying environmental values, such as Hays' (1987) analysis of the modern environmental movement, can provide a rich, in-depth understanding of a large number of factors influencing value change. A drawback of this approach, however, is that it does not permit rigorous testing of hypotheses.

Another way to gain insight into the evolution of environmental values is to analyze longitudinal data on public opinion toward environmental issues (e.g., Mitchell 1984, Dunlap and Scarce

1991). Trends in public concern for environmental quality based on data from opinion polls over the period 1965-1990 were recently analyzed by Dunlap (1992). A limitation of this study was that public opinion on environmental issues was not continuously monitored over this entire period. Several sets of relevant data were pieced together and supplemented with cross sectional data on public concern for environmental issues. Dunlap found that environmental concern grew rapidly in the late 1960's, declined in the 1970's but remained substantial, and then steadily increased throughout the 1980's, reaching unprecedented levels by the early 1990's. This approach is useful for outlining the broad contours of trends in public concern and attitudes toward the environment, but it is unable to shed light on changes in the underlying motivations and values associated with these trends.

A third approach to studying change in environmental values over time—and the approach taken in this study—is to empirically analyze published records using a content analysis procedure. Content analysis is a research technique for making valid inferences from text by systematically identifying and analyzing specified characteristics within text. It has been used by social scientists for many purposes, ranging from determining the psychological state of individuals to analyzing cultural patterns of groups, institutions, or societies over time (Weber 1990). An important premise of content analysis for our study is that the language used in social discourse is not "mere words"—it is an expression of our values. Historian Paul Hirt (1994:17) notes that "Language is a very important indicator of values and ideology. Industrial foresters use a common set of terms that both reflect and shape the perceptions and assumptions of those sharing that vocabulary." Changes in this language therefore reflect change in our systems of beliefs and values, which have a powerful influence on the way we think and behave. As Lakoff and Johnson (1980:145-146) observed: "It is reasonable enough to assume that words alone don't change reality. But changes in our conceptual system do change what is real for us and affect how we perceive the world and act upon those perceptions."

Content analysis has several advantages over other social science techniques for studying change in environmental values. First, a major advantage is its ability to analyze trends over long periods of time. Surveys, interviews, and case studies have produced many insights into current forest values, but they are unable to shed light on the evolution of values, nor do they provide a basis for projecting trends into the future. Second, content analysis is unobtrusive in the sense that neither the sender nor the receiver of messages contained in the text being analyzed is aware that the messages are being analyzed. Thus, unlike surveys and interviews, there is no danger that the act of measurement itself in content analysis will influence the expression of values. Third, unlike the historical approach, content analysis permits the statistical testing of hypotheses related to change in environmental values.[1] Fourth, quantitative indicators based on text can reveal aspects of value change not easily detected by other methods (Namenwirth and Weber 1987). Finally, computer-coded content analysis will likely become a more widely used and powerful research technique in the future as more and more text from a wide variety of sources becomes available in electronic form.

In this study, we used computer-coded content analysis to empirically analyze the evolution of forest values in the United States from 1982 through 1993. We developed a classification system that identifies four broad categories of forest values: economic/utilitarian, life support, aesthetic, and moral/spiritual values. A content analysis procedure was developed to identify expressions of these values related to public forests in data bases of text representing the views of three groups: the general public, forestry professionals, and mainstream environmentalists. The value system of each group was quantitatively summarized, and changes in value systems—i.e., changes in the relative frequency of expression of forest values—were tracked over time. Our main working hypotheses in this study were that (1) forest value systems have shifted over the study period, and (2) significant differences exist between the forest value systems of the three groups. In a concluding section, we discuss the implications of this study for ecosystem management.

[1] *We do not intend to imply here that qualitative research on environmental values is unimportant or less valid than quantitative research. To the contrary, our perspective is that qualitative research complements and informs quantitative research approaches.*

PREVIOUS CONTENT ANALYSES IN FORESTRY

The literature on content analysis is vast and multidisciplinary. Researchers in a wide range of fields—from journalism to linguistics—have carried out content analysis of texts for many decades. A comprehensive review of this body of literature is well beyond the scope of this paper. Instead, this section focuses on past content analyses of forestry and related natural resource texts. Some of the studies reviewed in this section used content analysis to examine research questions at one point in time; others analyzed time trends. All of the studies reviewed here used human-coded content analysis, although computer-coded procedures are becoming increasingly common.

An early content analysis in forestry was carried out by Stankey (1972). He developed a human-coded content analysis procedure and applied it in a case study of the Mission Mountains Primitive Area in Montana. The idea was to obtain public input on five management alternatives being considered for this area, ranging from wilderness to management for maximum public access and "optimum" resource management. A booklet describing the five management alternatives was distributed, and the public was asked to review and respond to these alternatives. More than 500 letters of response were received and analyzed. It was found that the wilderness alternative was overwhelmingly favored by respondents. Stankey also categorized the reasons that respondents gave for supporting or rejecting the various alternatives, which provided insights into the values that people hold for wildlands.

A major content analysis effort in forestry involved a system to analyze public input, which has been applied to a large number of cases and reported in many publications (e.g., Hendee *et al.* 1973, Hendee *et al.* 1974, Stankey *et al.* 1975, Clark and Stankey 1976). This human-coded system, called Codinvolve, was developed in 1972 as part of a USDA Forest Service effort to improve public involvement in decision-making. Codinvolve has been used to summarize and analyze written input on a specific management or policy issue, such as personal letters, form letters, reports, and petitions received by an agency. For example, this system was applied in the 1970's to issues such as the Roadless Area review on various national forests, an outbreak of Tussock Moth, and special-area studies. Attitudes and values held by the public about a particular issue were analyzed by tabulating the number of written inputs that were for, against, or about the issue in question, and by examining the justifications given to support the views expressed. The product of a Codinvolve analysis is a set of tables that quantitatively summarize public input.

A human-coded content analysis of the forest industry's corporate image advertising messages was carried out by Schoenfeld *et al.* (1980). This study, covering the period 1958 to 1977, analyzed a stratified random sample of U.S. forest industry advertisements in national periodicals. A dramatic decline in ads promoting product consumption was found over these 2 decades. A concomitant increase in ads emphasizing corporate social responsibility was found, especially ads conveying a "leadership message" that emphasizes a company's role in helping to solve major social problems. Leadership message content rose from 1 percent in 1958 to 1965 to 48 percent in 1972 to 1977, and ads recognizing corporate responsibility for solving environmental problems rose from 28 percent to 67 percent over the same two time periods. The authors also analyzed some of the specific environmental education themes contained in forest industry advertisements. They concluded that the forest industry has responded to the environmental movement in a largely positive manner.

Changing public attitudes toward wildlife were analyzed in a large-scale study by Kellert (1985). Kellert and his associates sampled and analyzed a total of 4,873 animal-related articles from four continuously published newspapers (two urban and two rural, from different geographic regions) covering the period 1900 to 1976. They collected information about the frequency of expression of 10 attitudes: aesthetic, dominionistic, ecologistic, humanistic, moralistic, naturalistic, negativistic, neutralistic, scientistic, and utilitarian. Using this approach, Kellert was able to track the relative frequency of expression of the 10 attitudes over time. He found marked differences in the frequency of expression of certain attitudes between urban and rural newspapers. For example, expression of utilitarian attitudes toward animals declined substantially in the Los Angeles Times, but decreased only slightly in the rural newspapers.

Another finding was that expression of the ecologistic attitude, defined by Kellert as "primary concern for the environment as a system, for interrelationships between wildlife species and natural habitats" (p. 21), increased significantly during the 1960's and 1970's in the Los Angeles Times. In the rural newspapers, however, expression of this attitude increased only slightly.

Wilson (1994) carried out a human-coded content analysis of public letters related to the forest plan revision on the Arapaho and Roosevelt National Forest and the Pawnee National Grassland. Out of about 600 letters received during the planning process, 27 exemplary letters and one citizen-based management proposal were examined for expressions of underlying values and the extent to which stakeholders endorsed or rejected the Forest Service's ecosystem management concept. The sample of letters included two categories of groups: environmental and commodity-oriented. Three indicators of value orientation were identified, including the use of value-laden language, prediction of negative consequences due to a certain course of action, and reference to "... sources so venerable that people won't dare question the position for fear of appearing to attack that source" (Creighton 1983:153). Wilson concluded that environmental groups tended to reject the Forest Service's concept of ecosystem management in favor of a biocentric ecosystem management paradigm, which implies a radical departure from traditional federal forest management. In contrast, commodity-oriented groups were seen to be more supportive of the Forest Service's approach to ecosystem management, which is seen as being largely congruent with their use-oriented beliefs and values.

Finally, Prof. Joanne Vining and several of her graduate students are, at the time of this writing, carrying out a content analysis of public responses to forest planning and management on the Hoosier National Forest in Indiana (Vining *et al.* 1994). This study includes a human-coded content analysis of letters from the general public, recreational organizations, environmental groups, and others that were received by the Hoosier in response to its initial management plan, a proposed amendment to the plan, and a revised plan. The main purpose of the study is "... to understand the respondents' perceptions of the management plans, values underlying their positions, and emotional content" (p. 1). A preliminary qualitative analysis of a sample of the letters revealed that certain values appear to be held in common among individuals with diverse interests. The existence of commonly held values and beliefs suggests that forest managers may be able to bridge the gap between conflicting parties and reach an improved outcome for all parties.

In addition to these studies of issues and values in forestry and related areas, content analysis has also been used to analyze various aspects of the forestry literature. Examples include a study of the range of topics included in the *Journal of Forestry* (Hendee *et al.* 1972) and a study of the international content of the *Journal of Forestry* (Burnett and Harrington 1989).

FOUR FOREST VALUES[2]

Forest values were defined earlier as relatively enduring conceptions of "the good" related to forests and forest ecosystems. In this study, we distinguish four distinct ways in which people value forests and forest ecosystems: economic/utilitarian, life support, aesthetic, and moral/spiritual value. These four categories of forest values are the basis of the content analysis described in the following sections. Figure 1 summarizes the relationships between these four broad types of value. Instrumental value is one concept of the good in which the good is equated with what is useful as a means to some desirable human end. The instrumental value of the environment arises from the fact that "... nature benefits us. Nature is useful: it serves a purpose, satisfies a preference, or meets a need" (Sagoff 1991:32). The instrumental value of a forest ecosystem stems from its utility as a means to specific ends or the realization of other values. For example, sawtimber is not prized for its own sake, but rather for its usefulness in building things that increase human welfare or well-being.

Economic, or more broadly, utilitarian value is a type of instrumental value. Like instrumental value in general, the economic/utilitarian value of a forest ecosystem stems from its utility for achieving human ends, where the ultimate end or goal is maximizing preference-satisfaction. Maximizing pleasure or happiness was the

[2] *See Bengston (1994c) for a more detailed discussion of this values classification system.*

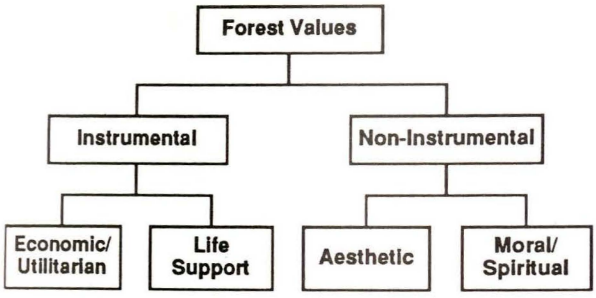

Figure 1.—*A classification of forest values.*

ultimate goal of classical utilitarians. But contemporary utilitarians and mainstream economists focus on the goal of maximizing preference-satisfaction (Sagoff 1988, Wenz 1988). The economic conception of the value of nature focuses on the usefulness of nature as expressed in individual preferences or an aggregation of individual preferences.

Life support value is another broad concept of what is instrumentally good about forest ecosystems. For people who hold this value, life-supporting environmental functions or services are good because human well-being depends on these functions and services. Like economic/utilitarian value, the basis of the life support value of forests is certain types of benefits that people receive from forests. But unlike economic value, an aggregation of people's preferences for these benefits is an inadequate measure of the importance of life support value. Many people are unaware of the life-supporting benefits that ecosystems provide, so aggregating preferences or willingness to pay for life-supporting environmental services will not produce a meaningful measure of their importance. The benefits exist whether or not we are aware of the role of forest ecosystems in providing them. Life support values of the environment are as essential to all economic activity and to life itself as the foundation of a building is to its structural integrity. The perception of life support value requires an observer or valuer who understands why the foundation is essential—someone who understands how ecosystems work and what life supporting services they provide. Pinchot succinctly expressed the life support value of the environment as follows: "Without natural resources life itself is impossible" (Pinchot 1987:505).

The concept of non-instrumental value focuses on the worth of something as an end in itself, rather than a means to some end.[3] We value our children, our spouse, and other humans in this way, in addition to valuing them instrumentally for the benefits we receive from them. They have "a good of their own"; they cannot be substituted for or replaced. Many people value forests non-instrumentally, in ways that go beyond their contribution to self-interested goals.

Aesthetic value is a type of non-instrumental value in which beauty is the concept of what is good. Sagoff (1991) noted that nature may be valued as an object of knowledge and perception, which he defined as aesthetic value. According to Sagoff, the basis of the aesthetic value of forests is not in the benefits that people receive from them, but in naturally occurring qualities of forests themselves. The perception of aesthetic value, however, requires an informed and discriminating observer or valuer. Aesthetic value has historically had and continues to have profound impacts on public land policy and management: "One of the main reasons that we have set aside certain natural areas as national, state, and county parks is because they are considered beautiful" (Callicott 1992b:12).

Finally, moral/spiritual value is also a type of non-instrumental value. We value an object morally when we regard it with love, affection, reverence, and respect (Sagoff 1991). This is what Aldo Leopold had in mind when he wrote: "It is inconceivable to me that an ethical relation

[3] *Many competing conceptions and theories of the non-instrumental or intrinsic value of nature have been put forward, and there is consequently a great deal of confusion and controversy about this topic. Some environmental philosophers argue that intrinsic value exists objectively in nature. According to this view, the intrinsic value of the natural world exists independently of humans. Other equally well-respected environmental philosophers disagree, maintaining the conventional view that value always necessarily involves a valuer as well as an object to be valued. Callicott (1992a) and Norton (1992) reviewed these and other concepts of intrinsic value. Our view on this debate is to remain agnostic—the question of whether or not value exists objectively in nature cannot be proved or disproved. We note, however, that many people hold the view that nature has value independent of humans, and therefore this view is highly relevant to public policy.*

to land can exist without love, respect, and admiration for land, and a high regard for its value. By value, I of course mean something far broader than mere economic value" (Leopold 1966:261). Spiritual value is a type of moral value. Environmental psychologists and philosophers have studied the spiritual value of forests and trees. One environmental psychologist defined spiritual as "... the experience of being related to or in touch with an 'other' that transcends one's individual sense of self and gives meaning to one's life at a deeper than intellectual level" (Schroeder 1992:25). The spiritual value of forests and all the life contained within them is often expressed in the writings of Native Americans (Jostad 1994). Attachment-orientation to nature (Mitchell *et al.* 1993, Williams *et al.* 1992), "topophilia" or sense of place (Tuan 1974, 1977; Turner 1989), and heritage value (Hammond 1985, Rolston 1985) are also included in this broad category.

This four-part classification system for forest values is used in this study as a framework for analyzing change in public forest values over time (fig. 1). However, we need to discuss three caveats about the classification system before proceeding. First, many other environmental value classification systems have been proposed and could have been used in this study. Categories of forest values could range from as few as two (e.g., instrumental and non-instrumental, or economic and non-economic) to dozens, depending on how broadly or narrowly the categories are defined. For example, 8 categories of social values provided by forests were identified in FEMAT (1993:VII-34), Rolston and Coufal (1991) identified 10 categories of forest values, Henning (1987) distinguished 13 categories of wilderness values, and Driver *et al.* (1987) distinguished 34 categories of wilderness benefits and values. These detailed classification systems typically suffer from the problem of value categories not being mutually exclusive. The use of such classification systems would create problems in statistically analyzing the results of a content analysis because the variables would be confounded.

Second, our classification system of distinctly different values does not deny the interweaving of values. For example, a house can both provide basic shelter and be gratifying to the eye of its beholder. An advertisement can serve both a commercial and an aesthetic interest. Similarly, forests are always valued in multiple ways simultaneously. In discussing the interweaving of values, Perry (1954:326) noted: "There is no situation, practical or cognitive, which is not also an aesthetic situation. Nor is there any aesthetic situation which does not tend to knowledge or action. Whichever attitude dominates will carry the others on its back or in its train... This mobility and subtlety of interblending is an unquestionable fact, which, however, must not be allowed to blur the differences, and obscure the fact that the aesthetic interest has a distinct motivation of its own." The fact that forest values are intimately interwoven does not contradict the view we take that each forest value has a distinct motivation that is relevant to public forest policy and management.

Finally, some may argue that our values classification system is incomplete—that it is missing a number of important and obvious forest values, such as recreational value, scientific value, biodiversity value, and wilderness value. In our view, this represents a confusion between values (as we have defined them here) and objects of value. Objects of value are the things that we care about or think are important; values are the ways in which we care about those things. Values are a conception of what is good about objects of value. Confusion between values and objects of value is common because the dividing line between these two concepts is subjective and dependent on how terms are defined.

Figure 2 lists some of the most common objects of value related to forests, including various direct uses by humans and management outputs, ecological processes, ecological components, and ecosystem conditions. People value most, if not all, of these objects in more than one way. For example, biodiversity may be valued for economic, life support, moral/spiritual, and perhaps aesthetic reasons. Scenic beauty is valued aesthetically and perhaps economically. In this study, we have focused on the four root values shown in figure 1, rather than on the countless objects of value associated with forest ecosystems.

METHODOLOGY

The basic idea of content analysis is that the large number of words contained in a piece of text are classified into content categories of interest. This requires the development of a

Uses by Humans (Including Cultural and Symbolic "Uses" or Components):

- Commodities
- Recreation
- Scientific
- Preservation for future generations
- Cultural and historic sites and artifacts
- Scenic beauty
- etc.

Ecological Processes:

- Nutrient cycles
- Hydrologic cycle
- Photosynthesis
- Soil formation
- etc.

Ecological Components:

- Plants, animals
- Wildlife habitat
- Water, soil
- Climate
- etc.

Ecosystem Conditions:

- Biological and ecosystem diversity
- Ecosystem health
- Ecosystem productivity
- Old growth
- etc.

Figure 2.—*Objects of value related to forests.*

coding scheme—a system for classifying text, designed to achieve the objectives of a particular study. The coding scheme is the heart of any content analysis. The first step in developing a coding scheme is to define the content categories, which in this study are the four types of forest value described in the preceding section. Therefore, our objective was to produce a set of reliable and valid indicators of the expression of our four broad categories of forest value.

A second step in developing a coding scheme is to define the basic unit of text to be classified. Individual words and phrases, sentences, paragraphs, and whole texts may be used as the unit of text for analysis. Choice of an appropriate unit of text depends on the specific research questions of interest. For certain purposes, large units of text are quite appropriate. But Weber (1990) noted that it is often difficult to achieve high reliability when coding large units of text. In this study, we have chosen to use individual words and phrases as the basic unit of text to be classified. This approach is most appropriate given the interweaving of forest values. For example, the sentence "The production of *goods and services* is essential, but it does not preclude maintaining the natural *beauty* of forests" expresses both economic/utilitarian value (as indicated by the phrase "goods and services") and aesthetic value (as indicated by the word "beauty"). By classifying individual words and phrases rather than larger units of text, our content analysis procedure can account for multiple expressions of forest values within a given unit of text.

The third step is to develop lists of words and phrases—"dictionaries" in the nomenclature of content analysis—associated with each of the content categories. These words and phrases serve as indicators of the concepts of interest. Forest values are abstract concepts not capable of being directly observed. The dictionaries enable us to indirectly observe and quantify expressions of forest values. Development of the forest value dictionaries involved an iterative process.[4] Initial dictionaries were developed for each value category by examining forestry-related texts that clearly express a particular type of value. Texts that emphasize a particular value are common in forestry. Classic examples include the writings of Gifford Pinchot, which tend to emphasize the economic/utilitarian value of forests, in striking contrast to the writings of John Muir, which frequently and strongly express aesthetic value. Articles by forest economists, traditional foresters, and others focusing on the economic or utilitarian value of forests were examined to identify an initial list of words and phrases expressing economic/utilitarian value. Similarly, the writings of forest ecologists and others focusing on ecological functions and values were examined to identify words expressing life support value; the writings of landscape architects,

[4] *The iterative process we used is similar to what David Fan, a geneticist at the University of Minnesota, refers to as the method of successive filtrations. Professor Fan explained the name of his content analysis method as follows: "From biochemistry, I learned that the study of complicated materials frequently benefits from a series of purification steps, each one removing extraneous components to yield progressively more homogeneous preparations enriched in relevant materials. This logic led to the strategy of successive 'filtrations' during the text analyses" (Fan 1988: xvii).*

aestheticians, environmental philosophers, and others were examined to identify indicators of aesthetic value; and the writings of environmental philosophers, environmental psychologists, Native Americans, and others were examined to identify indicators of moral or spiritual value. Almost 80 documents were examined to develop the initial forest value dictionaries.

The initial value dictionaries were then sent to subject matter specialists for review and refinement. A landscape architect who conducts research on the aesthetic value of forests reviewed the initial aesthetic value dictionary, an environmental psychologist involved in research on the spiritual value of forests reviewed the moral/spiritual value dictionary, and so on. The subject matter specialists were asked to comment on the dictionaries and suggest additional words and phrases that express forest values within their area of expertise.

The next step—examining the use of the words and phrases in our data bases of text—was crucial in refining the value dictionaries and ensuring their validity. Weber (1990:15) noted that "A content analysis variable is valid to the extent that it measures the construct the investigator intends it to measure." Using three databases of text on the national forests (described in the following section), we examined computer-generated key-word-in-context (KWIC) lists to determine which of the words and phrases contained in the draft value dictionaries were accurate indicators of the expression of the four values.[5] Tables 1a-d illustrate KWIC records for selected words from each of the value categories. Words and phrases found to be used ambiguously or incorrectly for this study were dropped from the dictionaries. For example, the word "spirit" was originally included in the moral/spiritual value dictionary, but we found it was used as an expression of the moral or spiritual value of forests only about 16 percent of the time. We also found phrases such as "a spirit of compromise" and "a cooperative spirit," which do not express the moral/spiritual value of forests. The word "spirit" was therefore dropped from the moral/spiritual value dictionary. We could cite many other examples of words and phrases that were dropped because they were found to be inaccurate indicators of the expression of particular values.

Table 1.—*Key-word-in-context records illustrating the expression of each of the four categories of forest values. Words in boldface are value indicators contained in the value dictionaries.*

a. Economic/utilitarian value expressions

"A third reason for concern about the decay of biodiversity is purely **economic**" (Ehrlich 1987:14).

"'The Forest Service, under the Department of Agriculture, is charged by Congress with **utilizing** the land, including **harvesting** trees to help supply the nation's **timber** needs,' Glassman said. 'It is frequently confused with the National Park Service, an agency in the Department of the Interior, which is charged with the preservation, rather than **utilization**, of the land,' Glassman said" (United Press International 10-29-87).

"... at least some insulation of the plan from legal challenges in order to quickly get more **timber** moving through the pipeline in **economically** depressed communities" (The Washington Post 6-18-93).

"Our success in managing America's forests has contributed mightily to the prosperity of the nation's **economy** and society. Oh yes, there have been environmental abuses by foresters and there will be more in the future, but the benefits created by our practices far outweigh the detrimental effects" (Stewart 1992:22).

"**Intensive management** must be increased to meet our projected population increases which will bring about a 75 percent increase in **timber** demand in the next three decades" (Hatfield 1974:5).

"**Timber** has a very important past. It is also more important today than many people realize, and its future is even brighter. Although plastics, steel, and other **raw materials** play a significant role in today's society..." (Youngs 1982:141).

(Table 1 continued on next page)

[5] *The computer software to generate the KWIC lists and carry out the actual content analysis was InfoTrend, developed by Prof. David Fan, Department of Genetics and Cell Biology, University of Minnesota.*

(Table 1 continued)

b. Life support value expressions

"It is a subsidy for which Americans pay dearly. An obvious cost is in the **degradation** of streams and the rich terrestrial ecosystems that border them" (Ehrlich 1987:12).

"Like any other timber cut, salvage sales punch roads into hitherto roadless areas, compact and **erode** soil, wound **watersheds**, and **fragment** forests" (Zuckerman 1993:32).

"Because **life-support** is in reality 'priceless', many thoughtful resource scientists feel that we should not try to put a monetary value on it, but instead designate large areas of the natural environment as the necessary **life-support** module for spaceship earth and take it out of the market entirely" (Odum 1977:104).

"Unfortunately, policymakers are just coming to recognize these dependancies as the natural storehouse of biological resources and **ecological services** is being diminished in all parts of the world at rates unprecedented in human history. The next few decades could see a level of global **extinction** rivaling that at the end..." (Blockstein 1990:15).

"A **carbon sink**; we burn immense quantities of fossil fuels, and look to the forest resource to sequester some part of the resulting excess of atmospheric carbon" (Ticknor 1992:42).

"The values of southern forested wetlands to society relate to each of the three major wetland functions — **habitat**, hydrology, and biogeochemical cycling" (Walbridge 1993:15).

(Table 1 continued on next column)

(Table 1 continued)

c. Aesthetic value expressions

"Of all the leafless trees, I think the most **beautiful** against the winter sky is the little flowering dogwood with its **graceful** horizontal limbs that reach skyward at their tips and form a fine lace pattern" (Borland 1984:5).

"Finally, and most **gloriously**, trees: More than 130 flowering trees and fourteen native conifers, as many total species as are to be found in all of Europe" (Turner 1990:32).

"A visitor to the area has half a million acres of virgin timber from which to select his own personal shrine, whether he prefers the **majestic** simplicity of the red pine, the elaborate **elegance** of birch, or the dark, primitive mood of the black spruce" (Wright and Ela 1974: 24, 26).

"Some 84 miles of river would fall under wild and **scenic** status, which is designed to keep the river in its **pristine** state, by limiting development" (United Press International 11-4-87).

"The country is rugged, and west of Churchville it is increasingly **beautiful**, hazy in the sunlight, the surrounding wilderness preserved in the George Washington National Forest" (The Washington Post 3-8-92).

"... **spectacular** areas of **natural beauty** — national parks, forests and historic sites..." (New York Times 8-25-91).

"For example, sloppy and unproffesional (sic) windrowing for site preparation where large amounts of top soil are deposited in the windrows is not only **ugly**, but it may reduce site productivity" (Alcock 1984:100).

(Table 1 continued on next page)

(Table 1 continued)

d. Moral/spiritual value expressions

"At one time, the chestnut occupied a **cherished**, seemingly unshakable place in the landscape" (Toner 1985:27).

"It is fresh and new-looking, a dark slash through the forest, a **desecration**, as out of place among these old trees as..." (Watkins 1986:14).

"One basic reason is ethical. Many of us feel that humanity, as the dominant animal on the planet, has a **moral** obligation to protect, as far as possible, the existence of other life forms" (Ehrlich 1987:14).

"But this long, deeply rooted history was well behind the newcomers to America. The **sacred** groves had indeed been cut, the **sacredness** of trees remembered only in trivial rituals of mistletoe and maypoles" (Turner 1983: 6).

"Roosevelt and his modern counterparts have long said their goal is to save for **future generations** land that is owned by all Americans" (New York Times 8-29-93).

"It is important that forest managers not ignore or reject the symbolic and emotional values of forests. The ability of trees to evoke **transcendent** spiritual values may be one of their greatest contributions to human culture" (Schroeder 1989:12).

"First and foremost, my forester must have a **land ethic**. They must feel the same bond to the land that they feel for one close to them" (Leahy 1990:32).

The process of refining the dictionaries by applying them to a large sample of text, assessing the accuracy of coding in context, and revising the dictionaries as needed was repeated until a satisfactory level of validity was achieved. We defined a "satisfactory level" as correct usage 80 percent of the time or more—a rule of thumb sometimes used in content analysis of this type. A final validity check of each of the four dictionaries on a representative, random sample of text from each of the three databases revealed that the dictionaries accurately captured expressions of value with a minimum of 80 percent accuracy, and most of the words and phrases contained in the dictionaries were valid value indicators 90 to 95 percent of the time.

In addition to concerns about validity in content analysis, the reliability or consistency of text classification is a concern when multiple human coders are used (e.g., Kellert 1985, Vining *et al.* 1994). Despite a well-conceived set of coding rules and careful training of human coders, people inevitably introduce variability in how they interpret and apply category definitions or other coding rules. In this study, we used computer coding to avoid problems with coder reliability—the computer always applies the coding rules consistently.

Tables 2a-d shows the final forest value dictionaries. Words and phrases in table 2a (economic/utilitarian value) include participants or actors that fill various roles related to utilitarian values (e.g., logger, tree farmer), various objects of utilitarian value (e.g., goods and services, raw materials), ends or goals related to utilitarian value (e.g., economic development, economic growth), and various means to achieve these ends (e.g., exports, intensive management).

The life support value dictionary shown in table 2b includes both the specialized language of ecologists and many words used by non-ecologists to describe various ecological functions and to express life support value. Included are actors that fill roles related to life support values (e.g., restoration ecologist, landscape ecologist), various ecosystem functions (e.g., carbon storage, soil stabilization, water purification), ends or goals related to life support value and indicators of the achievement of these goals (e.g., biodiversity, ecosystem health, keystone species), and various indicators of problems with environmental functions and loss or degradation of life support value (e.g., acid rain, erosion, degradation, fragmentation, unraveling). Creighton (1983) noted that one of the strategies for communicating values is prediction of dire consequences of a certain course of action: "The kind of consequence they fear will reflect their values. The man from the Chamber of Commerce will predict a loss of jobs, while the preservationist will predict a total disruption of the ecosystem" (p. 153). Our experience developing forest value dictionaries confirms Creighton's observation—words expressing negative, undesirable consequences were outstanding value indicators.

Table 2.—*Forest value dictionaries*

a. Economic/utilitarian value dictionary:

benefits of timber
bid price
commercial
commodity, commodities
crops of tree, tree crop
dollars in timber
earning, earnings
economic, economical, economically
economic analysis, economic development, economic effect, economic growth, economic impact, economic sense
economy, economies
exports, exporter, exporting
exploited for timber
firewood
forest product
goods and services
grazing fee
harvest level, harvest timber, harvest tree, harvesting timber, harvesting trees, harvesting of timber, harvesting of trees, timber harvest, tree harvest
housing market
industrial forest, industrial forestry, industrial land, industrial interests
intensive culture, intensive forest management, intensive forestry, intensive management, intensively managed
log price, log export, logs harvested
logger, logging
lumber and pulp, lumber consumption, lumber market, lumber price, lumber product, market price, market value
market system, non - market, nonmarket
monetary, monetizing, monetization
plantation
processed timber
profits, profitable
rangeland
raw log, raw materials
scarcity
stumpage
supply and demand, supply - demand
timber, timber dependent, timber export, timber industry, timber job, timber loss, timber management, timber operation, timber plantation, timber - producing, timber production, timber sale, timber shortage, shortage of timber, timber supply, timber supplies, supply of timber, timber value, timberland
tree farmer, tree farming, tree plantation
utilization, utilize, utilized, underutilized
wage
willing to pay, willing - to - pay, willingness to pay, willingness - to - pay
workforce

(Table 2 continued on next page)

(Table 2 continued)

b. Life support value dictionary:

absorb air pollutants, absorption of pollutants
air purifier, air purify, air purifying, air and water, air quality
assimilative capacity, waste assimilation
aquatic life, aquatic zone
breakdown of pollutants
acid drainage, acid precipitation, acid rain
biodiversity, bio - diversity, biotic diversity, ecosystem diversity, genetic diversity, landscape diversity, species diversity, structural diversity
biological diversity, biological health, biological integrity, biological legacy, biological legacies, biological processes, biological systems, biological wealth
biosphere, biospheric
biota, biotic
binding of soil, soil - binding
buffer strip, buffer zone
carbon cycle, carbon dioxide, carbon fixation, carbon sequestration, carbon sink, carbon storage, CO2 fixation, CO2 sequestration, CO2 sink, CO2 storage
climate amelioration, climate ameliorate, climate ameliorating, climate buffer, climate change, climate stabilization, climate stabilizer, climatic change, climatic regulation
community of life
complex web
damaging stream
degrade, degradation, degrading
detritus
downstream habitat
ecological, ecological benefits, ecological communities, ecological community, ecological diversity, ecological functions, ecological health, ecological integrity, ecological processes, ecological restoration, ecological services, ecological values, ecologically valuable, ecologically complex
ecosystem, ecosystem complexity, ecosystem functions, ecosystem functioning, ecosystem health, healthy ecosystem, ecosystem integrity, ecosystem maintenance, ecosystem processes, ecosystem resilience, ecosystem restoration, ecosystem services, ecosystem structure, ecosystem sustainability, ecosystem values
energy balance, energy capture, energy cycle, energy cycling, energy exchange, energy flow, flow of energy, energy flux, energy transfer, energy and material, potential energy
entropy
environment, environmental, environmental benefit, environmental baseline, environmental cost, environmental concern, environmental degradation, environmental function, environmental health, environmental impact, environmental processes, environmental quality, environmental restoration, environmental services, environmental toxin, environmental value, environmentally beneficial, environmentally sensitive, environmentally sustainable
erode, eroded, erodible, eroding, erosion
eutrophication
exotic species, extinct species, extinction, endemic species, endangered species
filtration
flood control, controlling flooding, flood mitigating, flood mitigation, storm abatement
food chain, food level, food web
forest health
fragment, fragmentation, fragmented, fragmenting
global change, global climate, global warming
greenhouse effect, greenhouse gases
groundwater, ground water, groundwater contamination
habitat, habitat protection, habitat loss, habitat fragmentation, wildlife habitat, fish habitat
homeostasis, homeostatic
hydrologic cycle, hydrological cycle
indicator species
integrity of ecosystem
jeopardized species
keystone species
landscape ecology, landscape ecologist
life - support, life - supporting, life supporting, life - sustaining, life sustaining, life - cycle, life cycle
material cycling
mycorrhizae, mycorrhizal
nature's services
nitrogen cycle, nitrogen cycling, fixation of nitrogen, nitrogen - fixing, nitrogen - fixation
nutrient cycle, nutrient - cycling, nutrient export
nutrient flux, nutrient pool, nutrient recycling, cycling of nutrients, nutrient uptake
old growth corridor
ozone depletion, ozone hole, ozone layer, stratospheric ozone
pollution
oxygen production, production of oxygen
photosynthesis

(Table 2 continued on next page)

(Table 2 continued)

radiation balance, radiation flux
restoration ecologist, restoration ecology, restored ecosystem
riparian, riparian area, riparian boundary, riparian communities, riparian system, riparian zone
revegetate
self - maintenance, self maintenance, self - replicating, self replicating, self - sustaining, self sustaining
siltation
species abundance, species loss, species - poor, species - richness, threatened species
soil conservation, soil erosion, soil formation, soil maintenance, soil movement, soil nutrients, soil productivity, soil recovery, soil stabilization, soil structure, generation of soil, topsoil loss, unstable soil
solar energy, solar equivalents, solar radiation
streamside buffers, stream sedimentation
trophic activity, trophic flow, trophic functioning, trophic interactions, trophic level, trophic organization, trophic specialization, trophic structure, trophic transfer, trophic web
unraveling
water cycle, water - purification, water - purifier, water - quality, water purification, water purifier, water quality
watershed, watershed stabilization, watershed stabilizer
wetland restoration, valuable wetland
wildlife habitat, wildlife population, wildlife support

c. Aesthetic value dictionary:

adorn, adorned
aesthetic, aesthetically
affective
artistic, artist, artist's
awe, awesome, awe - inspiring
beauteous, beautiful, beautifully, beauty, natural beauty
breathtaking, breathtakingly
captivate, captivating
charming
dazzling
delight, delights, delightful, delighted
ecstasy, ecstatic
elegant, elegance
emotive
enthral, enthralling
evoke, evocative, evocatively, evocation
exhilarate, exhilarated, exhilarating, exhilaration
expansive
exquisite, exquisiteness
fragrance, fragrant
glory, glories, glorify, glorious
graceful
grandeur
harmony, harmonious
heart - stopping
hue
landscape architecture, landscape architect
lavish
lovely
lush
luxuriant
magnificence, magnificent
majestic, majesty
marvelous
musical
natural setting
noble
orchestral
ornate, ornament, ornamented
panorama, panoramic
park - like, parklike
picturesque, picturesqueness
plaintive
poetic, poetical, poetry, poems
pristine
rapture, rapturous
resplendent
restorative
rustic
savor, savored, savory
scenery
scenic, scenically
scenic beauty, scenic value
sensibility, sensibilities
sensory
sensual, sensually, sensualness
sensuous, sensuously, sensuousness
stately, stateliness
spectacular
splendor, splendorous, splendrous
stunning, stunningly
stupendous
sublime, sublimely, sublimeness, sublimity
sumptuous, sumptuousness
superb

(Table 2 continued on next page)

(Table 2 continued)

symphony, symphonic
towering
ugly
unspoiled
untrammeled
vast expanse, vast wilderness
visceral
vista, vistas
visual, visual quality, visual resources
woodland realm

d. Moral/spiritual value dictionary:

ancient forest, ancient tree
anthropocentric, nonanthropocentric
biocentric
cathedral, cathedrals
cherish, cherished, cherishing
consecrate, consecrated, consecration
desecrate, desecration
dignity
divine, divinity
duties and obligations
ecocentric
eden, edenic
environmental ethics
exalted, exaltation, exaltedness, exaltedly
future generations
good steward
heritage
holier, holy, holiness
immortal, immortality
inherent value, intrinsic value
inspiration, inspirational, inspire, inspired, inspiring
irreplaceable
land ethic
legacy
meditate, meditation, meditative
morals, morality
mythic, mythical, mythological, mythology
national treasure, natural treasure
normative
paradise
posterity
profaned, profaning
religion, religious
revered, reverence, reverential, reverently
rights and duties
sacred, sacredness
sanctity, sanctuary, sanctuaries, sanctum
shrine, enshrine
spiritual
stewardship
tabernacle
transcendence, transcendent, transcendental, transcending
venerate, venerable

Table 2c—our aesthetic value dictionary—includes words such as "ugly," which expresses aesthetic value by calling attention to a loss or lack of aesthetic value, as in the phrase "clearcuts are *ugly* scars on the land." This word list should pick up both personal reflections on the aesthetic value of forests as well as expressions of aesthetic value found in the research literature on forest aesthetics. Our aesthetic value dictionary is based on fairly traditional notions of forest aesthetics, but it does reflect the wide range of senses, intellectual powers, and emotions involved in the perception and appreciation of aesthetic beauty, not just visual perception (e.g., words like emotive, fragrant, musical, orchestral, poetic, savor).

The final moral/spiritual value dictionary is shown in table 2d. This dictionary contains words and phrases found to be good indicators of the expression of the moral and spiritual value of forests, such as the following: biocentric, cherish, future generations, heritage, irreplaceable, land ethic, revered, sacred, and venerate. Although moral value and spiritual value are usually expressed in distinctive language, we combined them into a single category because they are closely related values and they are expressed relatively infrequently in the text we analyzed. This dictionary also includes words such as "desecrate" and "profaned," which indicate a loss or abuse of spiritual value.

It should be noted that the four value dictionaries do not each contain the same number of words and phrases. The life support value dictionary is the largest due to the inclusion of technical terms describing ecological functions and services, and the moral/spiritual value dictionary is the smallest. In developing these dictionaries, we found that their relative size has little impact on their ability to capture the bulk of the expressions of forest value contained in text because many of the words and phrases,

while accurate indicators of the expression of values, are used infrequently. The results of our analysis would not change significantly if we limited each dictionary to the 10 most frequently used words and phrases expressing a particular value. Therefore, we have focused on the quality of the words and phrases contained in each of our value dictionaries rather than on the quantity.

In the course of developing our four value dictionaries, we quickly discovered that the words and phrases in the economic dictionary were good indicators of the expression of economic/utilitarian value for forestry professionals and the public or news media, but they were poor indicators when applied to environmentalists. We found that in the environmental literature, economic/utilitarian words and phrases were usually cast in a negative or skeptical light—environmentalists frequently use economic words and phrases while expressing concern about the harmful environmental impacts of economic activities, rather than in positive expressions of economic/utilitarian value.[6] For example, we found many phrases such as "destructive logging practices," in which the word "destructive" appearing in close proximity to the word "logging" clearly indicates the perceived negative consequences of an economic activity. To handle simple cases such as this example, it would be possible to develop a set of transition rules as part of a content analysis procedure, which describe how two ideas in the text, represented by individual words or word groups, are combined to give a third idea. For example, the use of words such as "abuse," "devastating," "indiscriminate," "misuse," and "ravaged" in close proximity to certain economic words would be counted as expressions of negative economic value.

We developed a set of transition rules to capture negative expressions of economic/utilitarian value, but found that negative expressions of this value were much more subtle in most instances and could not be captured by a simple set of rules. The complexity and nuances of the language exceeded the ability of our transition rules to capture more than a small portion of the negative or skeptical expressions of economic/utilitarian value. For example, the phrase "... harvest levels are higher than what is sustainable on a long-term basis" (Watson 1990:25) expresses concern about an economic activity rather than positively expressing economic value. But no word or phrase within this phrase indicating this attitude of concern can be generalized to a large body of text.

To account for the negative expressions of economic/utilitarian value in the environmental literature, we conducted a human-coded content analysis on a representative, random sample of our database. This involved examining text in which economic/utilitarian words and phrases were used and coding the text into two categories: positive and negative expressions. The coding was carried out by one of the authors (Bengston) to avoid the coder-reliability problems that typically arise with multiple human coders. We found that the use of words and phrases from our economic/utilitarian dictionary was associated with positive value only 25 percent of the time in the environmental literature, and the remainder of the uses were clearly negative or skeptical. This percentage was found to be stable over the time period covered by our data and was used as a correction factor to adjust the computer-coded counts of expressions of economic/utilitarian value in the environmental literature.

We also found many qualified expressions of economic/utilitarian value in the environmental literature, i.e., expressions of economic value that were positive but which clearly ranked economic value below other values, such as the following example: "While the forests can and should help serve the immediate commodity needs of American citizens, this should not be allowed to compromise those priceless assets which are becoming increasingly unique to the national forests—and are no less real than our economic demands for lumber and paper, oil and iron" (The Wilderness Society 1983: 33, 38). Qualified but positive expressions of economic value such as this were coded as positive expressions.

Once the value dictionaries and coding rules were finalized, expressions of forest values were measured by applying them to databases of text, i.e., using the InfoTrend software, we searched our databases for the words and phrases con-

[6] *We found negative expressions of economic/utilitarian value, but not of life support, aesthetic, or moral/spiritual values. No one is against these latter values. We did, however, find expressions of concern over the negative economic impacts of what is viewed in the professional forestry literature as excessive environmental protection.*

tained in the four dictionaries. Each use of one of the words or phrases that was found counted as one expression of the particular value. For example, the sentence "Of all the leafless trees, I think the most *beautiful* against the winter sky is the little flowering dogwood with its *graceful* horizontal limbs that reach skyward at their tips and form a fine lace pattern" (Borland 1984:5) would be counted as two expressions of aesthetic value because of the use of the words "beautiful" and "graceful," which are included in our aesthetic value dictionary. The sentence "At one time, the chestnut occupied a *cherished*, seemingly unshakable place in the landscape" (Toner 1985:27) would be counted as one expression of moral/spiritual value due to the presence of the word "cherished," which is included in our moral/spiritual dictionary. The value expressions were then aggregated by each type of value, database, and year to develop time trends.

DATA

We developed databases of text on the national forests for three populations of interest: (1) the general public, (2) forestry professionals, and (3) environmentalists. The content of newspaper articles was used as a proxy for the expression of public forest values. Kellert, in his landmark study of wildlife values and attitudes, argued that newspaper articles "... can be relatively good indicators of generally held views and interests" (Kellert 1985:20). Others have argued that, rather than reflecting the attitudes and values of their readers, the news media shape the opinions and attitudes of the public (Fan 1988). We argue that there is some truth to each of these positions—the news media both reflect and shape public values to some degree—and therefore the news media may serve as a rough proxy for the values of the public. It is important to recognize that the use of news media text to identify expressions of national forest values for the public is a proxy and not a direct measure. Therefore, the value trends for this group should be interpreted more cautiously than trends for the other two groups.[7]

News media stories were obtained from the NEXIS electronic database, which contains the full texts of a large number of major and minor newspapers from all regions of the United States, and a large number of national, regional, and State news services. Stories included in our database were located using the search command "national forest." For the period 1982 to 1993, NEXIS was found to contain more than 15,000 stories that included the phrase "national forest," and out of this total population, we randomly retrieved 2,000 stories for inclusion in our database.

To minimize the inclusion of irrelevant text, the retrievals did not include the full text of stories. Only text within 100 words of the phrase "national forest"—50 words on either side—was downloaded. This greatly reduces the amount of irrelevant text that would have been retrieved from stories that mention the national forests only in passing, and helps ensure that the measured expressions of value are linked to national forests as opposed to other types of owners or land. Experience with many electronic text retrievals from news media sources on a wide range of topics has shown that text outside of a 50- to 100-word window around the search words is often not relevant to the topic of interest.[8] The public/news media database consists of 5.5 megabytes of text.

The values of forestry professionals were represented in a second database consisting of two components: (1) the complete text of keynote and general session papers presented at the Society of American Foresters National Conventions from 1982 through 1993, and (2) the complete text of articles in the *Journal of Forestry* that dealt specifically with national forests over the same period. This database was constructed by using an optical scanner to enter the text of the papers and articles. The database representing the views of forestry professionals consists of 415 articles and 6.7 megabytes of text.

Similarly, a database to represent the values of mainstream environmentalists was constructed by scanning in the complete text of articles

[7] *Strictly speaking, the data bases of text for forestry professionals and environmentalists are also indirect reflections of the values of these groups, because the included texts are the outcome of editorial decisions by people in leadership positions rather than a random sample of the populations of interest.*

[8] *Personal communication, David Fan, University of Minnesota, February 15, 1994.*

dealing with the national forests from magazines published by three major forest-related environmental groups: the National Wildlife Federation's magazine *National Wildlife*, the Sierra Club's *Sierra*, and The Wilderness Society's *Wilderness*. The National Wildlife Federation was the largest U.S. forest-related environmental organization in 1993, with 6,200,000 members (Hendee and Pitstick 1994). The Sierra Club and The Wilderness Society were also among the largest forest-related environmental groups in 1993, with 650,000 and 310,000 members, respectively. Taken together, text from the magazines published by these three groups should contain a good cross section of expressions of the values held by mainstream environmentalists about the national forests. This database contains the full text of 238 articles and 3.1 megabytes of text.

RESULTS

Figures 3a-d summarize the forest value time trends for all three groups. These figures show changes over time in the relative frequency of expression of forest values, i.e., the vertical axis is the share of a particular value as a percentage of total expressions of all four values. Therefore, if the absolute frequency of expression of one value increases while the absolute frequency of expression of the other three values remains constant, these figures would show an increase in relative frequency of expression for the one value and a decrease for the others. The trends shown in these figures have been smoothed using 3-year moving averages to reduce short-term fluctuations and to better reveal the underlying, long-term trends. The end points of each of the time trends (1982 and 1993) are not shown in the figures due to calculation of the 3-year moving averages.

A generalized logit model was used to test hypotheses concerning differences in forest value systems between the three groups and to test for a shift in forest value systems over time. Forest values were the response, and groups and time period were the explanatory variables. The model can be expressed as:

$$\log\left(\frac{\pi_{j|hi}}{\pi_{J|hi}}\right) = \alpha_j + \beta^g_{hj} + \beta^t_{ij}$$

where:

$\pi_{j|hi}$ = probability of value j expressed by group h in time period i

α = intercept

β^g = parameter for groups (public/news media, forestry professionals, environmentalists)

β^t = parameter for time period (where the following four time periods were used: 1982-84, 1985-87, 1988-90, 1991-93)

J = baseline category for calculating logits (moral/spiritual value)

We examined group effects and time effects through the hypotheses $\beta^g = 0$ (i.e., no difference between groups) and $\beta^t = 0$ (i.e., no difference between time periods). G^2 tests (likelihood-ratio chi-squared tests) were performed to examine these hypotheses. If the hypotheses are rejected, then there is evidence to believe that forest values differ between groups and have changed over time. The results indicated significant differences between groups ($G^2 = 1239.33$, $df = 6$, P-value < 0.001) and time periods ($G^2 = 185.38$, $df = 9$, and P-value < 0.001).

In addition to testing these general hypotheses, we also examined the individual trends for each value and group. As shown in figure 3a, the relative frequency of expression of economic/utilitarian value declined for both environmentalists and forestry professionals. The decline for forestry professionals is particularly pronounced, with expressions of economic/utilitarian value dropping from more than 80 percent of total value expressions in the early 1980's to about 55 percent in the early 1990's. The trend for the public/news media was basically flat throughout the 1980's and then began to decline in the late 1980's. A significant gap between environmentalists and the other two groups is evident in this figure. Based on relative frequency of expression, environmentalists appear to place much less weight on the economic/utilitarian value of the national forests. Figure 3a shows only the proportion of positive expressions of economic/utilitarian value in the environmental literature—the negative and skeptical expressions were factored out, as discussed earlier.

A linear probability model was used to statistically evaluate this and each of the other individual trends in forest values over time. Cochran-Armitage proportion trend tests (Agresti 1990) were carried out to determine the statistical significance of the trends shown in

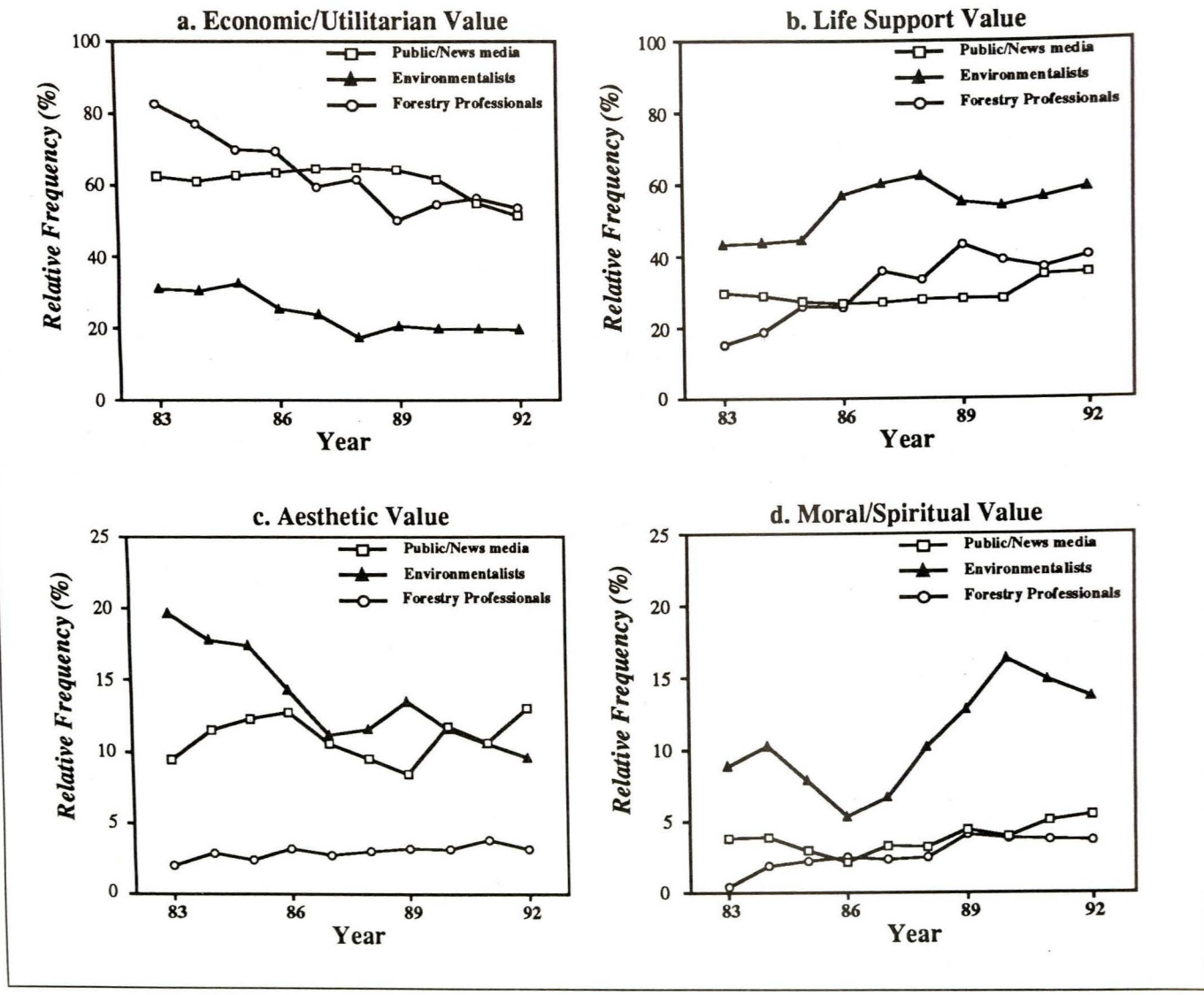

Figure 3.—*National forest value time trends.*

figures 3a-d. The value trend model can be expressed as:

$$\hat{\pi}_{jli} = p_j + b(t_i - \bar{t}),$$

where:

$\hat{\pi}_{jli}$ = probability of value j in time period i (j = 1, 2, 3, 4; i = 1, 2,..., 12)

p_j = sample proportion of value j in observation period

b = estimated coefficient

t_i = time period i

$\bar{t}$ = average time period

We tested the hypothesis that the slope b of the value trend model is zero. The statistic z^2, based on df = 1, tests for a linear trend in proportions (Agresti 1990):

$$z^2 = \left(\frac{b^2}{p_j(1-p_j)}\right)\sum n_{i\bullet}(t_i - \bar{t})^2$$

where:

$n_{i\bullet}$ = total value frequency in period i.

If the model is rejected, there is significant evidence to indicate linear trends in the proportions of forest values expressed over time.

The statistical results are shown in table 3. For economic/utilitarian value, this test provides strong evidence of a downward trend for forestry professionals and environmentalists (P-values < 0.001), but does not show much evidence of a trend for the public/news media over the entire 12-year period. When only the past 6 years are tested, however, the results suggest a recent downturn in relative frequency of expression of this value for the public/news media (P-value < 0.001).

Figure 3b shows the trends in relative frequency of expression of life support value. These trends are almost a mirror image of the economic/utilitarian trends, which is in part because the figures show relative frequency of expression rather than absolute frequencies. The trends for environmentalists and forestry professionals are upward and fairly dramatic. The public/news media group, on the other hand, seems to be lagging behind the other groups, with no discernible trend until the upturn in the expression of life support value in the early 1990's. As in the case of economic/utilitarian value, environmentalists stand out from the other groups—expressions of life support value of the national forests are found with greater relative frequency in the environmental literature. The Cochran-Armitage trend test gives strong evidence of an upward trend for forestry professionals and environmentalists over the entire time period (P-values < 0.001), but not for the public/news media (P-value > 0.25). Once again, however, there is evidence of an upward trend in the last 6 years for this group (P-value < 0.025).

Trends in the expression of aesthetic value for the national forests are shown in figure 3c. Note that the scale on the vertical axis has changed for figures 3c and 3d, reflecting the fact that aesthetic and moral/spiritual values are expressed much less frequently than economic/utilitarian and life support values in the text we analyzed. Based on the results of the trends test (table 3), there is no obvious trend for the public or forestry professionals. But a clear downward trend is evident for environmentalists (P-value < 0.01), and there is evidence of a significant increase in the expression of aesthetic value by the public/news media over the last 6 years of our data (P-value < 0.025). Forestry professionals, with a low relative frequency of expression of aesthetic value, clearly stand out from the other groups.

Finally, figure 3d shows the trends in the relative frequency of expression of moral/spiritual value. Results of the trend test provide evidence of a significant increase in expression of this value over time by forestry professionals (P-value < 0.001) and environmentalists (P-value < 0.05), but not by the public/news media (P-value < 0.25). As shown in figure 3d, environmentalists stand out with their greater relative frequency of expression of the moral/spiritual value of the national forests.

To facilitate comparison between groups in recent years, figure 4 summarizes the forest value system of each of the three groups for the last 4 years of our data (1990-93). This figure shows the average relative frequency of expression of each value, to portray only the current

Table 3.—*Results of forest value trends tests for 1982-1993 (z^2 statistic, with P-values shown in parentheses)*

	Forest value			
	Economic/ utilitarian	**Life support**	**Aesthetic**	**Moral/spiritual**
Group				
Forestry professionals	299.61 (< 0.001)	236.24 (< 0.001)	1.80 (< 0.25)	35.99 (< 0.001)
Environmentalists	13.85 (< 0.001)	13.34 (< 0.001)	7.46 (< 0.01)	4.68 (< 0.05)
Public/ news media	2.70 (< 0.1)	1.04 (> 0.25)	0.04 (> 0.25)	2.43 (< 0.25)

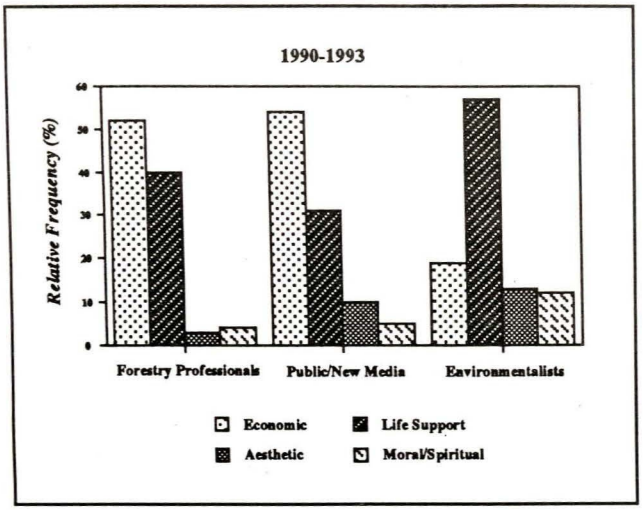

Figure 4.—*Forest value systems by group, 1990-1993.*

value system of each group. Economic/utilitarian value clearly still dominates the forest value systems of forestry professionals and the public/news media, accounting for more than half of the value expressions in recent years. Environmentalists place much less emphasis on the economic/utilitarian value of the national forests. Expressions of life support value clearly dominate the value system of environmentalists, and life support value is a strong second for the other groups. Life support value accounts for about 40 percent of total value expressions in recent years for forestry professionals and about 30 percent for the public/news media.

The aesthetic value of the national forests is expressed least often relative to the other values among forestry professionals, and significantly more often in the news media and environmental literature in recent years. Finally, figure 4 reveals that moral/spiritual value plays a significantly larger role in the current value system of environmentalists than for the other groups, and it plays the smallest role in the value system of forestry professionals. But, as revealed by figure 3d and the trends test (table 3), the relative frequency of expression of moral/spiritual value has increased steadily among forestry professionals.

DISCUSSION

The trends revealed in this study suggest that a gradual shift has been occurring in the structure of national forest values in the United States since the early 1980's, at least among forestry professionals and mainstream environmentalists. Given our definition of forest values as relatively enduring conceptions of what is good or desirable about forests and forest ecosystems, we would expect gradual change. If this analysis had found dramatic shifts in forest values over this short span of time, it would be reasonable to conclude that we were measuring something other than values, such as attitudes or opinions, which tend to be more variable. Value systems are relatively stable and change slowly. But, as our results suggest, even gradual shifts in the relative importance of values may eventually result in a significant reordering of priorities among values.

The decline in the relative frequency of expression of economic/utilitarian value and concomitant increase in life support value among forestry professionals and environmentalists are the most striking aspects of the shift in national forest values revealed by our analysis. The shift away from economic/utilitarian value is especially noteworthy for forestry professionals, because the philosophical base of traditional forestry is utilitarianism and the forestry profession has been heavily influenced by economic concepts of value (Kennedy 1985, McQuillan 1993). Thus, the decline in economic/utilitarian value suggests a fundamental change in the culture of forestry professionals.

Part of the explanation for this change may be gender diversification within forestry. Several studies have found a higher level of environmental concern among professional women than men in the USDA Forest Service (e.g., Kennedy and Mincolla 1986, Kennedy and Quigley 1989, Brown and Harris 1993) and in the general population (e.g., McStay and Dunlap 1983, Kellert and Berry 1987, Steger and Witt 1989). Greater environmental concern among women forestry professionals may show up in our data as a greater emphasis on life support value. Brown and Harris (1993) reported that gender diversification has proceeded rapidly in the Forest Service—the share of professional foresters who were women rose from 1.7 percent in 1978 to 16 percent in 1990, an eightfold increase. But this still represents a small share of the professional workforce, and gender diversification is therefore unlikely to be a significant factor driving the shift in values.

Another part of the explanation for the shift away from economic/utilitarian and toward life

support value among forestry professionals may be disciplinary diversification within agencies. In the past, the utilitarian-based and commodity-oriented disciplines of forestry and range management dominated public land management agencies. But in recent decades disciplines that place more emphasis on the protection of ecosystem health, such as ecology and wildlife biology, have grown in representation and influence. This would be manifested in our data as an increase in the expression of life support value and decreased expression of economic/utilitarian value. Blumenthal (1991) reported that over the past 20 years, the number of fisheries biologists has increased tenfold, wildlife biologists have increased sixfold, and hydrologists have doubled in the USDA Forest Service. Based on their nationwide study of Forest Service employees, Brown and Harris (1993) concluded that the growing numbers of non-foresters within the Agency will have a significant impact on organizational values and on the Agency's resource management paradigm.

The relatively low frequency of expression of aesthetic and moral/spiritual values that we observed—particularly among forestry professionals—may be due in part to the nature of the text that was analyzed in this study. The professional forestry literature—as represented by the Society of American Foresters proceedings and articles from the *Journal of Forestry*—is of a more technical or scientific nature than the other bodies of text. Some may argue that the language of science is not comparable to the other texts. But in developing our aesthetic and moral/spiritual value dictionaries, we were careful to include words and phrases that are frequently used to express these values in the research literature. Thus, in addition to capturing the more poetic expressions of the aesthetic and moral/spiritual value of forests that are found in the environmental literature, our approach should also capture expressions of these values that are more technical in nature. The low frequency of expression of aesthetic and moral/spiritual values in the forestry literature is therefore more likely because, while forestry has diversified, the number of forestry professionals trained in disciplines that tend to emphasize these values (e.g., landscape architecture, environmental psychology, natural resource anthropology and sociology, etc.) is still extremely small.

Another aspect of the low frequency of expression of non-instrumental values among forestry professionals may be that these values still tend to be "closet" values, and forestry professionals are often uncomfortable with expressing their aesthetic and moral/spiritual values. Therefore, they cloak their non-instrumental values behind life support and economic values, which serve as proxies for aesthetic and moral/spiritual concerns. This closet phenomenon was documented by Blatt (1986) for the case of aesthetic zoning, where ordinances were often passed to protect aesthetics but were cloaked behind reasons such as "maintenance of property values," "promotion of community stability," or "protection of health, safety, and general welfare." Others have argued that many environmental preservation debates and conflicts really rest on aesthetic and moral/spiritual motivations, but justifications for preservation are often based on more defensible and "scientific" life support and economic values because our scientific and legal systems are not yet able to accept these deeper social concerns (e.g., Smardon 1984).

The absence of a trend for the public/news media and forestry professionals and downward trend for environmentalists for aesthetic value—and the concomitant increase in life support value—may in part be due to the changing nature of environmental aesthetics. Gobster (1994, 1995) and Callicott (1992b) described an ecologically informed aesthetic. If an ecological aesthetic is beginning to replace the more traditional forest aesthetic, then it is possible that our aesthetic value dictionary is limited by its inability to identify these ecologically oriented expressions of aesthetic value.

Our finding that non-instrumental values (aesthetic and moral/spiritual) are expressed less frequently than instrumental values should not be interpreted to mean that they are less important. There are at least two reasons for this finding. First, some have argued that it is inappropriate to directly compare or trade off instrumental and non-instrumental values against each other (e.g., Sagoff 1988, Kuntz 1970). Instrumental and non-instrumental values are not commensurate, according to this view, and therefore cannot be meaningfully compared. This view was implicit in Rokeach's (1973) classic and still widely used approach to

analyzing human value systems. In this approach, survey respondents are asked to rank the importance of a list of instrumental values relative to each other and to rank a list of non-instrumental (or, in Rokeach's terms, "terminal") values, but no comparison of instrumental and non-instrumental values is made. Second, we cannot assume that one expression of a particular value is equivalent to or carries the same weight as one expression of another value. In some valuation contexts, one value is salient and determinant regardless of how widely held it is or how frequently it is expressed.

The highly statistically significant increase in the expression of moral/spiritual value by forestry professionals is an important trend. As shown in figure 3d, the relative frequency of expression of this value increased almost steadily over the time period analyzed. Another indicator of this trend is the adoption of a land ethic canon by the Society of American Foresters in 1992 and subsequent discussion of this modification of the Society's code of ethics (Cornett *et al.* 1994). Interest in and discussion of environmental ethics appear to have increased in recent years among professional foresters, which may be due in part to the ongoing shift from a natural resource management paradigm with a utilitarian philosophical base (multiple-use forestry) to a management paradigm with a Leopoldian environmental ethic as the philosophical base (ecosystem management).

CONCLUSIONS AND IMPLICATIONS FOR ECOSYSTEM MANAGEMENT

Drawing normative conclusions from this analysis is complicated by several factors. First, this study offers just one method and one set of indicators, but methodological pluralism is essential to gain a more complete understanding of forest values (Bengston 1994a). Each of the many disciplinary approaches to conceptualizing and studying values has something to contribute to an overall understanding of the complex and diverse values of forest ecosystems. Therefore, the results of this study should not be viewed in isolation from results produced by other approaches to studying forest values. Second, as mentioned earlier, the text used to identify expressions of national forest values for the public is a proxy (i.e., we used the news media as a proxy for the public). The value trends for this group therefore should be interpreted more cautiously than trends for the other two groups. Third, conclusions about differences in values across the three groups should be made cautiously, because of differences in the nature of the publications used to represent each group. Fourth, this study has examined changes in national forest values from a nationwide perspective. It is important to recognize that each national forest possesses unique biophysical features, social settings, and histories. These differences obviously have a strong impact on the values associated with individual national forests, which should not be ignored in planning and management. As suggested by Shands (1991), the distinctive values of each national forest need to be recognized. A better understanding of national forest values from a nationwide perspective is useful mainly at a strategic level. To be useful at the level of individual national forests, the findings of this study should be interpreted in conjunction with value analyses of individual forests (e.g., Vining and Ebreo 1991, Vining *et al.* 1994). Finally, this study considers only three groups of national forest stakeholders. The values of the full array of stakeholders—including commodity-oriented groups, recreationists of various types, radical environmentalists, and others—should ideally be included.

What conclusions can then be drawn from this study? First, our findings tend to confirm the following intuitive observation from the report of the Forest Ecosystem Management and Assessment Team: "The paradox is that those social values for which our ability to define and measure is poorest, are the very ones that appear to be of increasing importance in our society" (FEMAT 1993: VII-33). Our findings suggest a shift in forest values away from easily defined and measured economic values, and toward values that are much more difficult to measure and that have often been neglected or ignored. Specifically, the life support and moral/spiritual values of national forests do appear to be of increasing importance to forestry professionals, to environmentalists, and, in recent years, to the public/news media. Life support and moral/spiritual values cannot be adequately understood through the positivist-utilitarian approaches to studying environmental values that dominated in the past (Bengston 1994b). A

much broader array of disciplinary perspectives and methods—both quantitative and qualitative—will be required to increase our understanding of these values. Research methods that may be useful include in-depth interviews, focus groups, content analysis, and interpretation of texts (Lewis 1994, Patterson and Williams[9], Schroeder[10]).

Second, the low frequency of expression of aesthetic and moral/spiritual values by forestry professionals relative to environmentalists may be a key to better understanding the intensity of conflict surrounding the management of the national forests. The fact that environmentalists express these values more frequently is important, because these "deeper," non-instrumental values help explain why people care so passionately about environmental issues (Williams *et al.* 1992, Mitchell *et al.* 1993, Schroeder[10]). People typically become much more emotionally involved if their forest value system is predominately non-instrumental in nature, in part because they perceive a threat of loss of something for which there is no substitute.[11] Schroeder[10] (p. 3) argued that what we have termed moral/spiritual value is critical for understanding conflict over forest management:

> Experiential values that do not lend themselves to this kind of measurement and valuation (for example, sense of place and spiritual values) have often been disregarded. Yet it is precisely these kinds of values, rooted in intuitive and emotional experiences, that have motivated many people to take legal and political action against forest managers. For ecosystem management to truly include humans as a part of ecosystems, these kinds of values must be recognized and dealt with in managing forests.

The low relative frequency of expression of non-instrumental values by forestry professionals points out the need for greater understanding and appreciation of these values among foresters. This may be required to help bridge the gap in communication and world view between public forest managers and key stakeholder groups, and may help ameliorate conflict in forest planning and management.

Third, *to the extent that our proxy for public values is valid,* our analysis suggests that there may be significant differences between the forest value systems of the public and environmentalists. This finding requires further study because it contradicts previous research on the similarities in views of the national forests between environmentalists and the public. For example, Vining and Ebreo (1991) found a striking similarity in the ratings of importance of 10 goals for the management of the Mark Twain National Forest by environmentalists and the public. At a broader level, it has been argued, based on an extensive analysis of public opinion polls, that "Over the past two decades, environmentalism has evolved into a major sociopolitical force in our society, and one of the key reasons for this has been the widespread support that the environmental movement has received from the general public" (Dunlap 1992:89). This was supported by a recent nationwide survey that found that nearly three-quarters of Americans have a moderately or highly favorable opinion of most environmental groups (Times Mirror 1994).

Clearly, more research is needed on this question. But our finding of differences in the forest value systems of the public and environmentalists suggests that other factors beyond similarity in values may be needed to explain the growth of environmentalism into a major political force. An obvious factor is revealed by the trends in membership of forest-related environmental groups during the period of analysis of this study, i.e., rapid growth in the size of environmental groups has increased their political

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[9] *Patterson, Michael E.; Williams, Daniel R. 1994. A hermeneutic research program for gathering data to help achieve diversity in wildland recreation opportunities. Unpublished manuscript, Clemson University, Department of Parks, Recreation, and Tourism Management, Clemson, SC.*

[10] *Schroeder, H.W. 1994. Problem analysis: problem one. Research Work Unit FS-NC-4902, Managing Forest Environments for Urban Populations. Chicago, IL: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 6 p. (Copies may be obtained by writing Dr. Herbert Schroeder, USDA Forest Service, 845 Chicago Ave., Suite 225, Evanston, IL 60202-2537.)*

[11] *Sagoff (1991) identified substitutability as an important distinction between instrumental and non-instrumental value: "Insofar as we care about an object for instrumental reasons, we would accept a substitute—for example, ball point pens in place of quills—if it performs the same function at a lower cost... With [non-instrumental] value, it is different" (p. 33).*

clout. During the 1980's, membership in the 44 largest national environmental groups doubled, reaching 15 million total members in 1991 (Hendee and Pitstick 1992).[12]

Fourth, our finding of a statistically significant decline in the relative frequency of expression of economic/utilitarian value by forestry professionals and environmentalists, and a recent downturn in frequency of such expression by the public/news media, suggests that the age of the economist in national forest planning may be drawing to a close as we move into the era of ecosystem management. The strong influence of economic thinking during the era of multiple-use forestry was noted by Kennedy (1985). Economic analyses of public forest management have often implicitly assumed or explicitly stated that economic efficiency should be the primary goal for the management of these forests. For example, Bowes and Krutilla (1989:32) stated that "... under economic multiple-use management, land should be treated over time with the sequence of activities that is expected to provide the greatest discounted net present value from the resulting flow of goods and services." Sagoff (1988:217) pointed out the fundamental problem with this view of the role of economics in public environmental planning and management as follows: "In the past, economists have too often proposed that society pursue efficiency in the allocation of resources rather than the ethical and cultural goals stated in public law."

The declining influence of economic analysis in forestry decisionmaking and policy has been noted in recent years.[13] The shift in national forest values that we have measured may help explain this decline in influence, and it suggests a changing role for economics in the era of ecosystem management. Compared to the goal of pursuing economic efficiency and reducing the problem facing public land managers to the "optimal" choice of product mix, the goal of maintaining the health and integrity of forest ecosystems and social systems is more consistent with the values underlying ecosystem management. A broader approach to economics that is consistent with the land ethic and goals of ecosystem management is needed (Iverson and Alston 1993). Ecological economists have begun the task of developing an economics that focuses on the sustainability of natural and social systems rather than on narrowly defined economic efficiency (e.g., see Costanza 1991).

Finally, our finding that the life support value of the national forests plays a prominent and growing role in the value systems of forestry professionals, environmentalists and, in recent years, the public/news media suggests that this concept of what is good about forests is now widely recognized and appreciated. The importance of life support value that we found tends to confirm environmental historian Donald Worster's observation about the influence of ecology on our culture: "So influential has their branch of science become that our time might well be called the 'Age of Ecology'" (Worster 1994:xiii). The increase in the expression of life support value that we observed suggests that ecosystem management—often characterized as being based on ecological principles and placing greater emphasis on ecological values than traditional forest management—may indeed be an idea whose time has come.

[12] *This contrasts sharply with a decline in membership in professional societies and environmental groups that promote a more traditional conservation agenda. Between 1980 and 1993, membership of the Society of American Foresters declined by 10 percent, the Soil and Water Conservation Society declined by 16 percent, and the American Forestry Association declined by 56 percent (Hendee and Pitstick 1994).*

[13] *For example, this issue was discussed extensively at a Forest Service National Economics Meeting in Denver, Colorado, in June 1991.*

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1995. **Changing National Forest values: a content analysis.** Res. Pap. NC-323. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 29 p.

Empirically analyzes the evolution of national forest values in recent years. A computerized content analysis procedure was developed and used to analyze the forest value systems of forestry professionals, mainstream environmentalists, and the public. National forest values were found to have shifted significantly over the study period.

KEY WORDS: Content analysis, ecosystem management, forest values, generalized logit model, national forests.

Our job at the North Central Forest Experiment Station is discovering and creating new knowledge and technology in the field of natural resources and conveying this information to the people who can use it. As a new generation of forests emerges in our region, managers are confronted with two unique challenges: (1) Dealing with the great diversity in composition, quality, and ownership of the forests, and (2) Reconciling the conflicting demands of the people who use them. Helping the forest manager meet these challenges while protecting the environment is what research at North Central is all about.